SECTION V – INTERIM PLAN FOR OPERATING THE PROJECT

Until funding is available to fully repair the embankment, the project will be operated using a conditional operating plan. The conditional operating plan is based on close monitoring of piezometric water levels in the embankment to monitor downstream slope instability. In addition, an event alert system will be in place to prevent the initiation/progression of internal erosion into the failing drainage system. Data flow communication for the conditional operating plan and the event alert system will be from the Portland District Geotechnical Design Section to the Portland District Reservoir Regulation and Water Quality Section to the Northwestern Division Reservoir Control Center.

5.01. Conditional Operating Plan. The maximum reservoir elevation for flood control will depend on the piezometric water levels in the embankment. For example, consider a heavy rain event occurring in mid-December. If piezometric water levels in the embankment are low, the reservoir will be allowed to fill to the established maximum flood control pool elevation of 375.1 ft. However, if piezometric water levels in the embankment are high, the reservoir will only be allowed to fill to elevation 371 ft for flood control. The establishing of elevation 371 ft as the critical reservoir elevation for downstream slope stability with high piezometric water levels is discussed below.

Reservoir filling will start February 1st, as normal. The normal reservoir filling schedule will be followed until the reservoir reaches elevation 371 ft, typically near the end of March. If piezometric water levels in the embankment are low, the reservoir will continue following the normal filling schedule to the maximum conservation pool elevation of 373.5 ft. If piezometric water levels are too high, the reservoir will be held at elevation 371 ft.

The conditional operating plan may be altered in the future if additional information indicates conditions safer than originally thought, or if future measures are implemented to improve drainage and stability.

The critical reservoir elevation of 371 ft is based on a preliminary stability analysis with an assumed phreatic surface in the embankment during the rainy season. The phreatic surface in the embankment was assumed to be a straight line between the reservoir elevation and the highest observed elevation of seepage emerging from the downstream slope, 360 ft. This approximation assumes the phreatic surface due to seepage from the reservoir is added to by rainwater infiltration as shown in Figure 5-1. Figure 5-2 shows safe and unsafe phreatic surfaces with seepage emerging from the downstream slope at elevation 360 ft. The sprinkler tests described in section III, 3.02 will provide measurements of the phreatic surface caused by simulated rainfall infiltration. This measured phreatic surface will be used in the stability analysis included in the future letter report. Another measured output of the sprinkler tests will be the strength of the embankment softened by the simulated rainfall infiltration, which will also be included in the future stability analysis. This measured softened strength is expected to be higher than the current assumed embankment strength used in the preliminary stability

analysis. The results of the future stability analysis may change the plan for operating the project.

If the future stability analysis predicts unsafe conditions due to high piezometric levels during the rainy season, an interim measure may be designed and constructed to improve the stability of the downstream slope. Examples of possible interim measures are 1) installing a shallow drainage system on the downstream slope, 2) placing a granular berm on the downstream slope, and 3) covering the downstream slope with a membrane to prevent rainwater infiltration.

5.02. Event Alert System. Measurement of drain flow rates and visual observations will be used to watch for the initiation/progression of internal erosion into the failing drainage system. Drain flow rates from the pressure transducers behind the drain weirs will be monitored at Lookout Point and the Portland District office. Drain flow rates will also be periodically measured by hand by Fern Ridge project staff to verify the data from the pressure transducers. The event alert system will notify the appropriate personnel if there is a significant or unusual increase in flow rate indicating initiation/progression of internal erosion.

Figure 5-1. Influence of rainwater infiltration assumed in preliminary stability analysis.

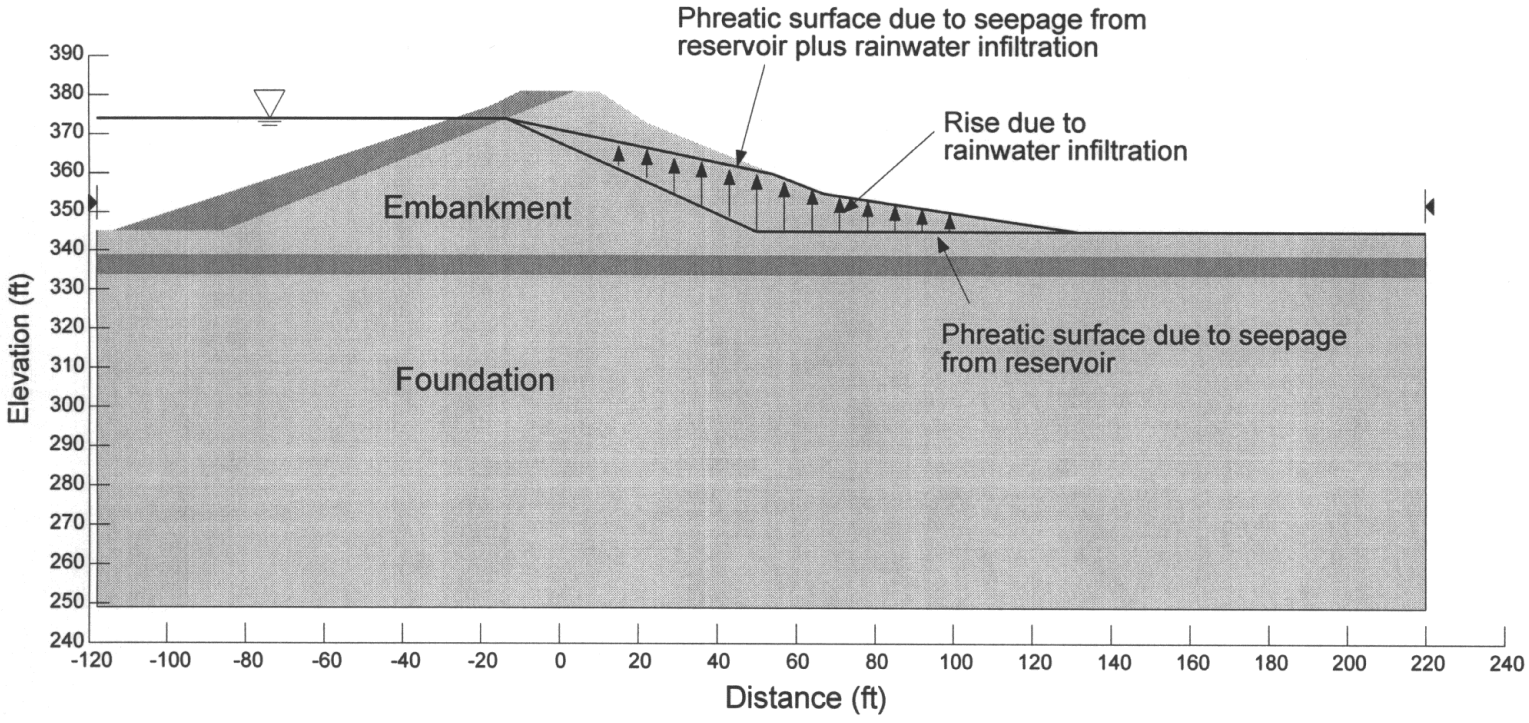
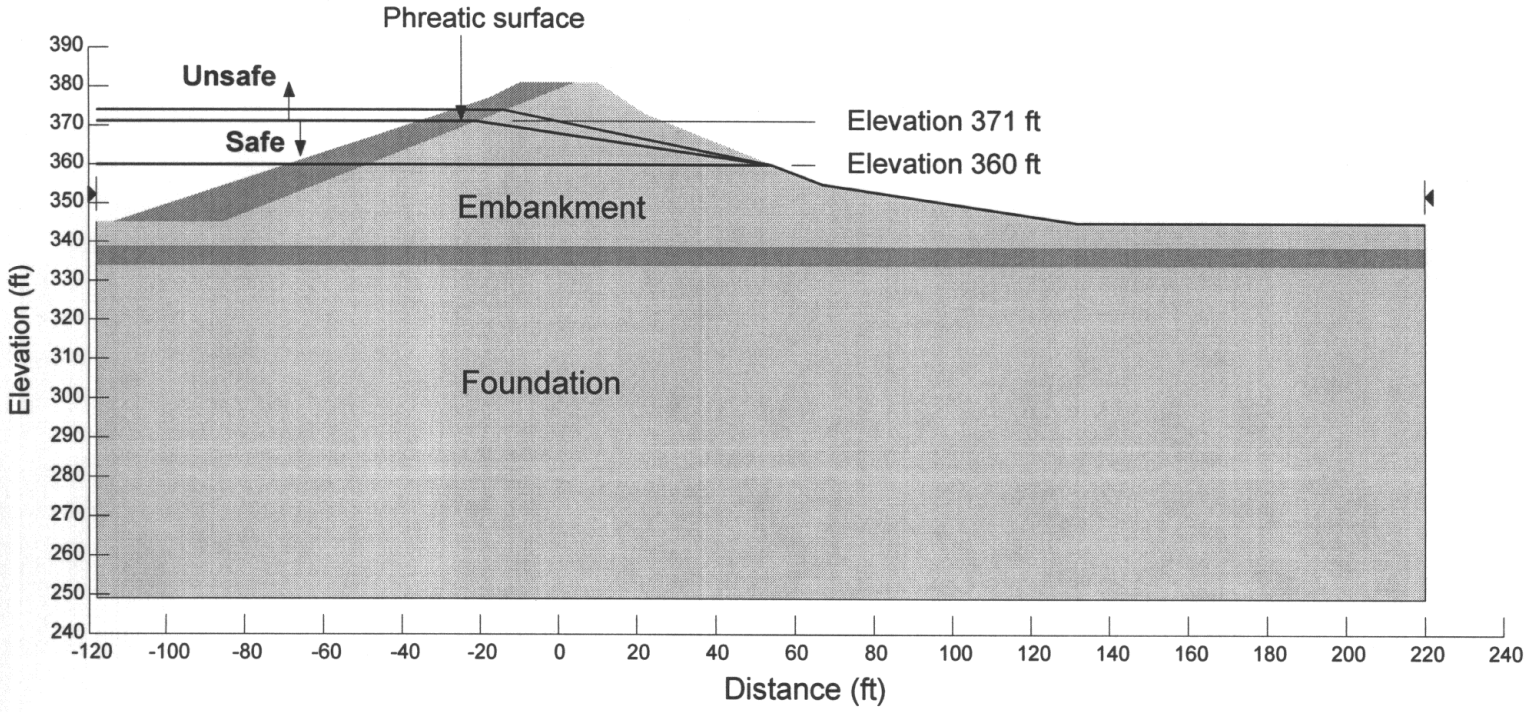


Figure 5-2. Safe and unsafe phreatic surfaces in embankment for downstream slope stability (preliminary analysis) with seepage emerging at elevation 360 ft.



SECTION VI – SUMMARY

Several features of distress have recently been observed at Fern Ridge Dam. Three depressions exist on the downstream slope. The 60-year-old drainage system is failing, initiated by corrosion of the corrugated metal pipe. Flow rates from the drainage system increase during heavy rain events. During the rainy season, seepage was observed emerging from the downstream slope of the embankment. These features of distress have led to two primary concerns: 1) internal erosion into the failing drainage system and 2) downstream slope instability.

Borings were made into two of the depressions in May/June 2003. Soft soil was found beneath the depressions. Test pits will be dug in Fall/Winter 2003 to investigate the extent of the soft soil and to look for voids.

Video inspection of the lateral drains in September 2002 showed severe deterioration in some places. The main drain will be inspected in Fall/Winter 2003.

Weirs and pressure transducers were installed at the outlets of 7 of the lateral drains. Measured flow rates can be monitored continuously at Lookout Point and the Portland District office to watch for increases due to internal erosion into the drainage system.

By October, 2003, thirty-eight piezometers with pressure transducers will be installed to measure water levels in the dam. This information is important for evaluating the stability of the downstream slope of the embankment. Sprinkler tests will be performed in Fall 2003 to simulate rainfall and the condition of seepage emerging from the embankment slope. Measurements of piezometric water levels and the strength of the softened embankment soil during the sprinkler tests will improve the evaluation of the downstream slope stability during the rainy seasons.

The interim plan for operating the project involves a conditional operating plan for the reservoir elevation and an event alert system to prevent the initiation/progression of internal erosion into the failing drainage system. The conditional operating plan may be altered in the future if further investigations indicate more favorable conditions, or if interim measures are constructed to improve downstream slope stability.

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